CLAIMS:

1. A digital receiver for use in radar systems, comprising:

an intermediate frequency (IF) converter to translate a higher frequency 1st IF to a lower frequency 2nd IF;

an analog-to-digital converter (ADC);

a digital signal processor (DSP) including IF (range) domain and Doppler (azimuth) domain filtering, and

at least one phase history data interface;

wherein the IF converter translates a given radar 1st IF frequency to a 2nd IF necessary to facilitate sampling and efficient quadrature demodulation, and at least one phase history output interface moves data to an image formation processor or a raw phase history storage subsystem.

2. The invention of claim 1 wherein an out-of-band noise source provides a dither signal to the ADC to cause randomization of the ADC quantization error to thereby enhance the signal-to-noise ratio (SNR).

3. The invention of claim 2 wherein the noise is formed in a manner so that its spectrum does not overlap the desired signal, allowing its subsequent removal by filtering.

4. The invention of claim 3 wherein the noise introduced by the out-of-band noise source is removed to improve the radar receiver signal to noise ratio (SNR).

5. The invention of claim 1 wherein said second IF frequency is one fourth of the ADC sample frequency.

6. The invention of claim 5 wherein a quadrature demodulator and 1st-stage IF filter converts the sampled 2nd IF at the output of the ADC to base-band quadrature outputs (I and Q).

7. The invention of claim 5 further comprising a programmable data generator at the output of the ADC that provides a test signal to excite the DSP chain without the introduction of the analog IF input.

8. The invention of claim 6 further comprising a range pane filter connected to said quadrature outputs and having an IF filter with digitally selectable IF bandwidth.

9. The invention of claim 8 further comprising

a high-pass filter at the output of said pane filter for removal of residual DC (zero frequency) at the output of the quadrature demodulator;

a $0/\pi$ demodulator at the output of said high-pass filter for removing spurious modulation introduced by a radar exciter ; and

a vector presummer connected to said $0/\pi$ demodulator for adding multiple input vectors to produce a single output vector (azimuth sample).

10. The invention of claim 9 further comprising an azimuth prefilter (APF) with digitally selectable Doppler bandwidth connected to said presummer to filter presumed output vectors in the azimuth sample or Doppler domain.

11. The invention of claim 10 further comprising a 2nd range pane filter stage with digitally selectable bandwidth connected to said prefilter for further filtering and decimating each range vector.

12. The invention of claim 8 wherein a said IF filter has a multitude of IF bandwidths that are selectable to maximize the radar pulse width, thus maximizing the radar SNR versus radar operating range.

13. The invention of claims 8 wherein said IF filter has reprogrammable coefficients.

14. The invention of claim 1 wherein two phase history output interfaces are provided.

15. The invention of claim 14 wherein one of the phase history outputs provides raw presummed phase histories destined for a data recording system.

16. The invention of claim 15 wherein one of the phase history outputs provides range and Doppler pre-filtered and decimated data via a switch-fabric interface to a real-time image formation processor.

17. The invention of claim 16 wherein an out-of-band noise source provides a dither signal to the ADC to cause randomization of the ADC quantization error to thereby enhance the signal-to-noise ratio (SNR).

18. The invention of claim 17 wherein the noise is formed in a manner so that its spectrum does not overlap the desired signal, allowing its subsequent removal by filtering.

19. The invention of claim 18 wherein the noise introduced by the out-of-band noise source is removed to improve the radar receiver signal to noise ratio (SNR).

20. The invention of claim 1 wherein the first IF is at about 4GHz and the second IF frequency is at about 250 MHz.